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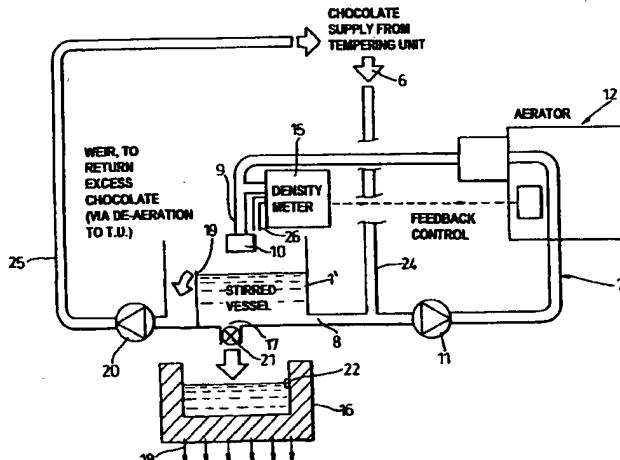
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(54) Title: CONFECTIONERY AERATION SYSTEM



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(57) Abstract: A confectionery aeration system has a confectionery vessel (1; 1') for holding aerated confectionery material and provided in the lower part thereof with at least one feed outlet (3; 17) for feeding aerated confectionery to a confectionery producing process. A confectionery material re-circulation circuit (7) connects a re-circulation outlet (8) of the vessel to an inlet (9) of the vessel, the re-circulation circuit being provided with an aerator (12) arranged to aerate confectionery material flowing from the re-circulation outlet to the vessel inlet. The inlet (9) of the vessel (1) is provided with a back-pressure producing means (10) for maintaining a super-atmospheric pressure in the confectionery material in that part of the re-circulation circuit between the aerator and the vessel inlet. Fresh confectionery material is supplied to a supply connection (24) in the re-circulation circuit located upstream of the aerator. Excess confectionery material in the vessel (1) may be returned (25) to the fresh supply by way of a de-aeration unit and tempering unit. In a pre-existing installation provided with a supply hopper (16) the feed outlet (17) of the vessel leads into the supply hopper (16).

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— *With amended claims and statement.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CONFECTIONERY AERATION SYSTEM

This invention relates to confectionery aeration systems for producing an aerated confectionery material, particularly, but not exclusively, aerated chocolate.

5 The invention is applicable to the aeration of any material with similar flow characteristics to liquid chocolate, for example pastes, batters, slurries and any similar flowable material where aeration is required.

Where the context admits, the term 'aerated' will be used herein to cover bubbles containing gases other than air, such as bubbles of nitrogen.

10 It is known to inject air into the chocolate flow into a depositor hopper but this provides difficulty of control, and the degree of aeration is limited.

According to the invention a confectionery aeration system comprises a confectionery vessel for holding aerated confectionery material and
15 provided in the lower part thereof with at least one feed outlet for feeding aerated confectionery to a confectionery producing process, a confectionery material re-circulation circuit connecting a re-circulation outlet of the vessel to an inlet of the vessel, the re-circulation circuit comprising an aerator arranged to aerate confectionery material flowing
20 from the re-circulation outlet to the vessel inlet, the vessel inlet being provided with a back-pressure producing means so arranged as to maintain a super-atmospheric pressure in the confectionery material in that part of the re-circulation circuit between the aerator and the vessel inlet, and a supply connection to the re-circulation circuit for feeding
25 fresh confectionery material into the re-circulation circuit upstream of the aerator.

The fresh confectionery material may contain some excess of the aerated material which preferably has been de-aerated prior to inclusion in the fresh supply.

The inventive system is capable of providing the confectionery material
5 supplied to the confectionery producing process with a relatively high degree of aeration.

The inventive system is particularly suitable, but not exclusively, for the production of deposited confectionery material containing microscopic bubbles. The vessel may then be constituted by a depositor hopper, the
10 feed outlet of which feeds a plurality of depositor outlets.

The vessel may, however, be used in conjunction with an existing supply hopper, particularly where the invention is being applied to an existing confectionery process installation the supply hopper of which cannot easily be modified. The vessel feed outlet may then be used to supply
15 aerated material to the supply hopper.

Thus, said vessel provides a reservoir of aerated material which is used to replenish the supply hopper.

Preferably the rate of injection of gas into the confectionery material by the aerator is controlled in response to a measure of the density of
20 confectionery material in the supply to the vessel inlet, and preferably a density measuring means is positioned just prior to the back-pressure producing means.

Preferably a pump is provided in the re-circulation circuit between the re-circulation outlet of the vessel and the aerator for pumping material

around the re-circulation circuit against the flow resistance of the aerator and the back-pressure created by the back-pressure producing means.

The supply connection is preferably located on the inlet side of the pump.

5 The supply of fresh confectionery material to the supply connection is preferably controlled by the output of a level sensing means responsive to the level of confectionery material in the vessel.

The invention will now be further described, by way of example only, with reference to the accompanying drawings in which:

10 Figure 1 is a flow diagram of a confectionery depositor system incorporating an aeration system in accordance with the invention; and

Figure 2 is a flow diagram of a modified aeration system in accordance with the invention and suitable for supplying aerated material to the supply hopper of a confectionery process.

15 A depositor hopper 1 is of well-known construction, apart from the inlet and outlet connections thereto, the base 2 of the hopper being formed with a plurality of hopper outlets 3 controlled by respective plungers, not shown, which feed respective depositor heads in known manner.

20 With reference to Figure 1, in use, the depositor hopper 1 contains chocolate, or some other confectionery material, the level of the upper surface of the chocolate being sensed by a level probe 4. The signal from level probe 4 is used to control a control means such as a solenoid-operated supply valve 5 which controls the supply 6 of fresh chocolate from a temperer, not shown, into a re-circulation circuit 7.

The re-circulation circuit 7 extends from a re-circulation outlet 8 of the hopper 1 to a hopper inlet 9, the inlet 9 leading into the upper part of the hopper 1, whereas the re-circulation outlet 8 leaves from the mid-height of the hopper 1. The hopper inlet 9 is provided with a back-pressure
5 producing means such as a restrictor valve 10, which is conveniently located within the upper part of hopper 1.

The re-circulation circuit 7 incorporates a pump 11 and an aerator 12. The pump inlet 13 is connected by a Y-connection 14 freely with the re-circulation outlet 8 and with the outlet 24 of solenoid valve 5. Pump 11
10 operates continuously both to recirculate chocolate from the hopper 1 around the circuit 7 so that the chocolate is recirculated through aerator 7, and to pump fresh material to the hopper 1 from supply 6 under the control of valve 5.

The aerator 12 is preferably an aerating head of the kind in which after
15 injection of gas into the confectionery material, the confectionery material is subjected to shearing forces in order to reduce bubble size.

The pressure of the chocolate in the re-circulation circuit between the aerator and the inlet 9 is preferably arranged to be substantially in the range 2 to 10 atmospheres, above atmospheric pressure, and preferably
20 substantially in the range 3 to 6 atmospheres above atmospheric pressure.

Aerator 12 is fed with nitrogen or other suitable gas and the amount of gas injected into the chocolate by aerator 12 is controlled in response to the output of a density meter 15 which measures the density of the aerated chocolate just prior to the chocolate being fed to the hopper
25 inlet 9.

The device 15 is typically of the vibrating tube type, and for example suitable units are those available from PAAR Scientific Limited, 594 Kingston Road, Raynes Park, London SW20 8DN under designation DPR Density meter.

5 The aerator 12 will inject gas bubbles into fresh chocolate being fed from supply 6 and will also provide further aeration of chocolate being recirculated from the hopper 1, thereby maintaining aeration of the chocolate in hopper 1 which supplies the hopper outlets 3.

10 The provision of a re-circulation circuit 7 containing aerator 12 enables a relatively high degree of aeration to be maintained throughout the hopper 1 and thus in the chocolate delivered by hopper outlets 3, and also progressively reduces the size of the bubbles in the recirculated chocolate, thereby improving the appearance of the deposited material.

15 The back-pressure-reducing valve can be any suitable form of flow-restrictor and may be controllable to adjust the back-pressure.

In Figure 2 parts of the system corresponding to those of the system of Figure 1 have been given corresponding reference numerals.

Figure 2 shows an application of the invention to feed aerated chocolate to an existing hopper 16 of a chocolate handling machine, such as 20 moulding or dipping machines. It may not be practical or economically feasible to replace the existing hopper 16 of the chocolate handling machine with a hopper of the form of the hopper 1 of Figure 1, but a supplementary vessel 1' can usually be accommodated, the re-circulation circuit 7 connecting with the vessel 1' in order to maintain a reservoir of 25 aerated chocolate which is used to feed the hopper 16 by way of vessel outlet 17. Vessel 1' is preferably stirred.

Hopper 16 is provided in its base with one or more hopper outlets 18 which can be used, for example, to supply flowable aerated material to a plurality of depositor outlets, or to a dipping machine of the type used in ice cream manufacture.

- 5 Any suitable form of level control may be used to maintain the aerated chocolate in vessel 1' at a desired level, and a weir 19 is shown in Figure 2 for that purpose, a pump 20 being provided to return excess chocolate from weir 19 via a return pipe 25 to the tempering unit, not shown by way of a de-aerator, not shown.
- 10 A valve 21 controls the supply of aerated chocolate from the outlet of vessel 1' to the hopper 16, the valve 21 being controlled by a level sensor 22 in hopper 16.

As shown in Figure 2 a back-pressure producing means 10 has been provided on the main hopper inlet 9. A separate back-pressure producing means may be required on the output 26 of the density meter, depending upon the flow resistance associated with the density meter itself.

CLAIMS

1. A confectionery aeration system comprising a confectionery vessel (1; 1') for holding aerated confectionery material and provided in the lower part thereof with at least one feed outlet (3; 17) for feeding aerated confectionery to a confectionery producing process, a confectionery material re-circulation circuit (7) connecting a re-circulation outlet (8) of the vessel to an inlet (9) of the vessel, the re-circulation circuit comprising an aerator (12) arranged to aerate confectionery material flowing from the re-circulation outlet to the vessel inlet, the vessel inlet being provided with a back-pressure producing means (10) so arranged as to maintain a super-atmospheric pressure in the confectionery material in that part of the re-circulation circuit between the aerator and the vessel inlet, and a supply connection (24) to the re-circulation circuit for feeding fresh confectionery material into the re-circulation circuit upstream of the aerator.
2. A system as claimed in claim 1 comprising a return circuit (25) for returning excess aerated material to the fresh supply (6), the return circuit comprising a de-aeration means.
3. A system as claimed in claim 1 or claim 2, in which said vessel is constituted by a depositor hopper (1), the feed outlet of which feeds a plurality of depositor outlets (3).
4. A system as claimed in any one of claims 1 to 3, in which the supply of fresh confectionery material to the supply connection is controlled by the output of a level sensing means (4) responsive to the level of confectionery material in the vessel.

5. A system as claimed in claim 1 or claim 2 applied to a pre-existing confectionery process installation which comprises a supply hopper (16), said feed outlet (17) of the confectionery vessel (1') being arranged to lead into the supply hopper.
- 5 6. A system as claimed in any of the preceding claims, in which the rate of injection of gas into the confectionery material by the aerator is controlled in response to a measure of the density of confectionery material in the supply to the vessel inlet (9).
- 10 7. A system as claimed in claim 6, in which the density measuring means is positioned just prior to the back-pressure producing means (10).
- 15 8. A system as claimed in any of the preceding claims comprising a pump (11) in the re-circulation circuit between the re-circulation outlet (8) of the vessel and the aerator (12) for pumping material around the re-circulation circuit (7) against the flow resistance of the aerator and the back-pressure created by the back-pressure producing means (10).
9. A system as claimed in claim 8, in which the supply connection is located on the inlet side (13) of the pump (11).

AMENDED CLAIMS

[received by the International Bureau on 06 April 2001 (06.04.01);
original claim 1 amended; remaining claims unchanged (1 page)]

1. A confectionery aeration system comprising a confectionery vessel (1; 1') for holding aerated confectionery material and provided in the lower part thereof with at least one feed outlet (3; 17) for feeding aerated confectionery to a confectionery producing process, a confectionery material re-circulation circuit (7) connecting a re-circulation outlet (8) of the vessel to an inlet (9) of the vessel, the re-circulation circuit comprising an aerator (12) arranged to further aerate aerated confectionery material flowing from the re-circulation outlet to the vessel inlet, the vessel inlet being provided with a back-pressure producing means (10) so arranged as to maintain a super-atmospheric pressure in the confectionery material in that part of the re-circulation circuit between the aerator and the vessel inlet, and a supply connection (24) to the re-circulation circuit for feeding fresh confectionery material into the re-circulation circuit upstream of the aerator, the recirculation circuit being without any de-aeration means for producing any substantial de-aeration of the aerated material in the flow path between the re-circulation outlet and the aerator.
2. A system as claimed in claim 1 comprising a return circuit (25) for returning excess aerated material to the fresh supply (6), the return circuit comprising a de-aeration means.
3. A system as claimed in claim 1 or claim 2, in which said vessel is constituted by a depositor hopper (1), the feed outlet of which feeds a plurality of depositor outlets (3).
- 25 4. A system as claimed in any one of claims 1 to 3, in which the supply of fresh confectionery material to the supply connection is controlled by the output of a level sensing means (4) responsive to the level of confectionery material in the vessel.

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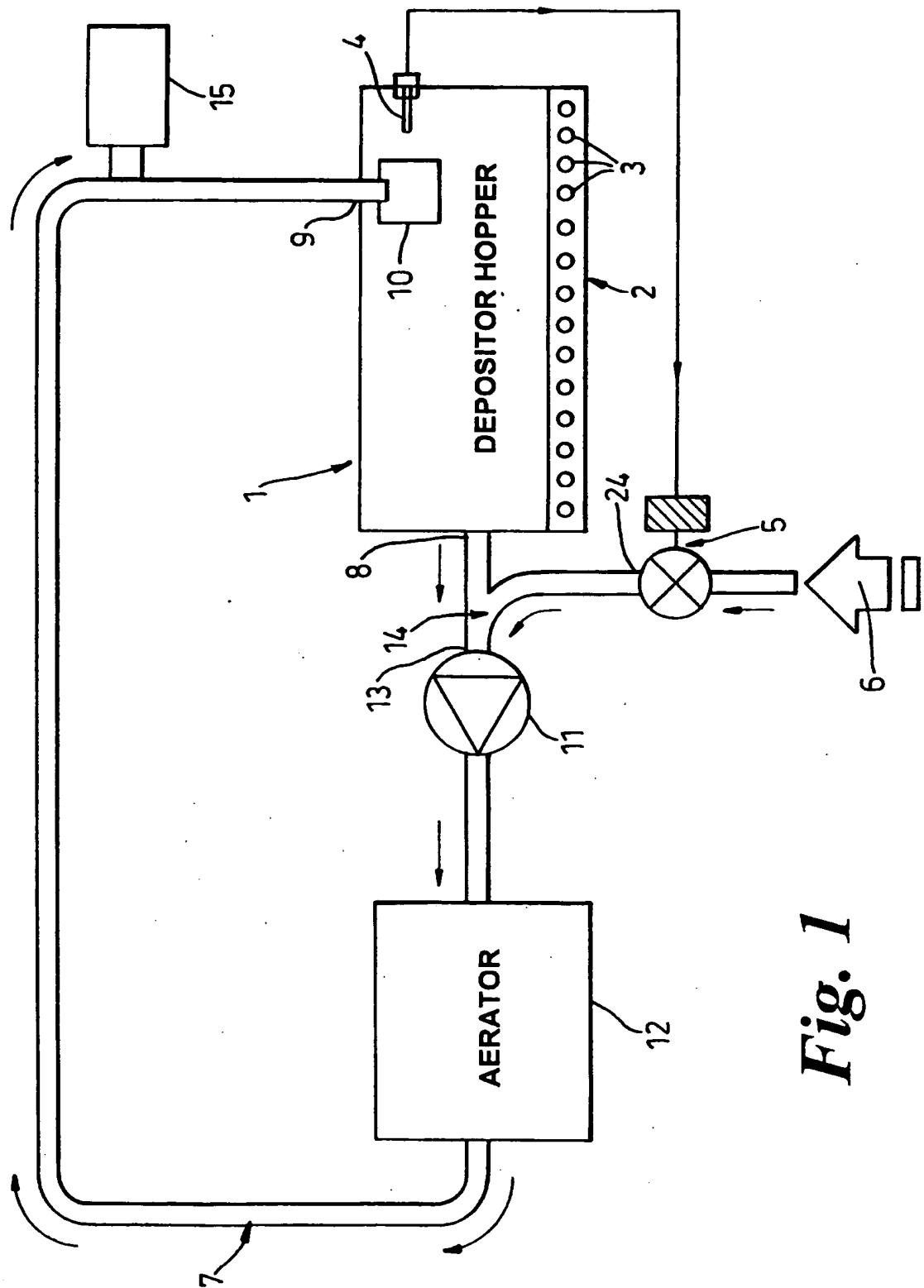


Fig. 1

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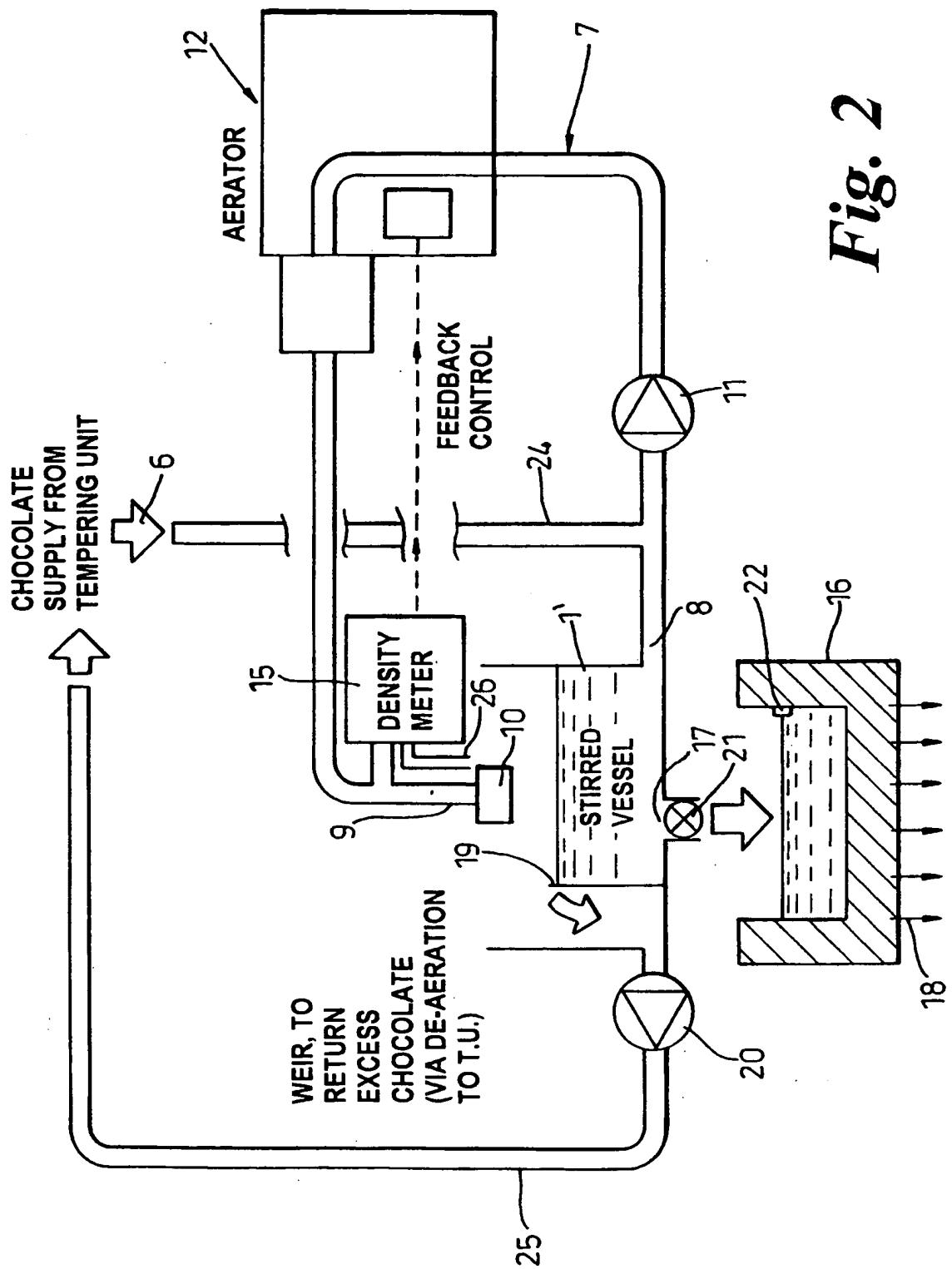


Fig. 2

STATEMENT UNDER ARTICLE 19(1)

New claim 1 specifies that the aerator (12) is arranged to 'further aerate aerated confectionery material' in line with page 5, line 6. This is achieved by the absence of a de-aerator in the re-circulation circuit, as distinct from EP 0724836 A2 in which all re-circulated material is de-aerated by de-aerator 1. The final part of new claim 1 specifies the absence of a de-aerator in the applicant's re-circulation circuit.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/04008

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A23G1/10 A23P1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23G A23P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	EP 0 724 836 A (BINDLER MASCHF GEBR GMBH CO KG) 7 August 1996 (1996-08-07)	1-3,5,6, 8,9
Y	column 2, line 39 -column 3, line 57; figure	7
Y	US 4 418 089 A (BOUETTE DAVID W) 29 November 1983 (1983-11-29) the whole document	7
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E	WO 00 64269 A (COULTHARD ROGER DAVID ;PRANGE ANTHONY JOHN (GB); APV LTD (GB); BRO) 2 November 2000 (2000-11-02) figures 2A,2B	1-9
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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- *&* document member of the same patent family

Date of the actual completion of the international search

2 February 2001

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 502 360 A (GIANT SRL) 9 September 1992 (1992-09-09) -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

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